Key Management Challenges

with Smart Grid and the Cloud

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Managing Cyber Risk Through Innovation and Engineering

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Smart Grid and Cloud

- Smart Grid Functions moving to Cloud
  - Collection of Data from Meters/Sensors/Devices
  - Rapid Analysis of Big Data
  - Control and Management of Smart Grid Operations

- Why Cloud Computing for Smart Grid?
  - Supports “Elasticity” needed in Smart Grid Operations
  - Lower Cost and Rapid Deployment
  - Higher Availability and Reliability
  - Connects variety of Stakeholders through Standard Interfaces
    - Providers (Generators, Distributors, Utilities, etc.)
    - Users (Industrial, Commercial, Home, etc.)

Cloud Based Systems – Uncertainties

- Processor
  - Where is my process running?
  - Am I sharing the processor with other users/organizations?
- Data Storage
  - Where does my data reside?
  - Is my data co-resident with other users' data?
- Communication
  - How does my CSP know who I am?
  - How is my connection to cloud components protected?
- Administration
  - Who administers the Cloud Infrastructure?
  - Who has access to my data? My activity history?
- Key Management
  - Where and how are keys: Generated? Stored?
  - How are keys: Distributed? Protected? Recovered? Destroyed?

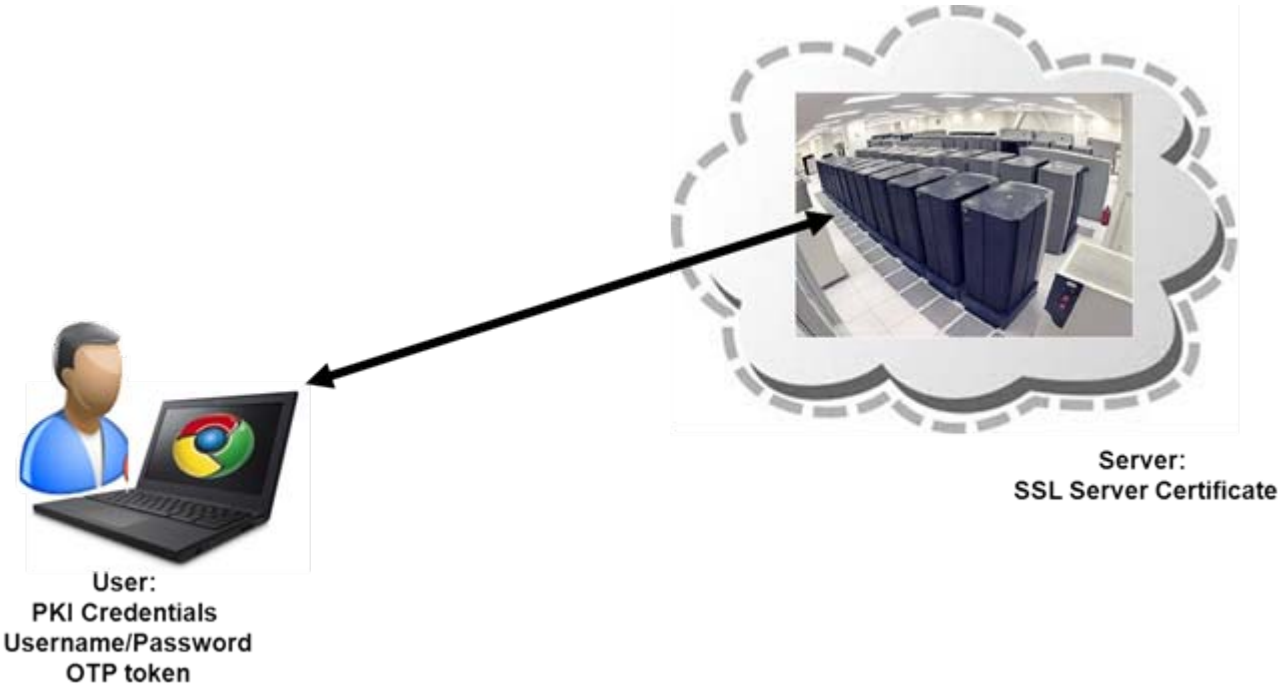
Cryptography Integral to Cloud

- Supports strong remote authentication
  - Regular users (1- or 2-factor)
  - Administrators (2-factor)
- Implements strong communication protocols
  - Between user (browser) and cloud (SSL/TLS)
- Partitions User data in co-tenancy environments
- Provides data confidentiality
  - From cloud administrators
  - From Cloud co-tenants
- Supports data integrity
  - Tamper-detection of critical data through MACs and digital signatures
- Strengthens Audit Log Management
  - Signed and time-stamped audit logs

Cryptographic Key Management

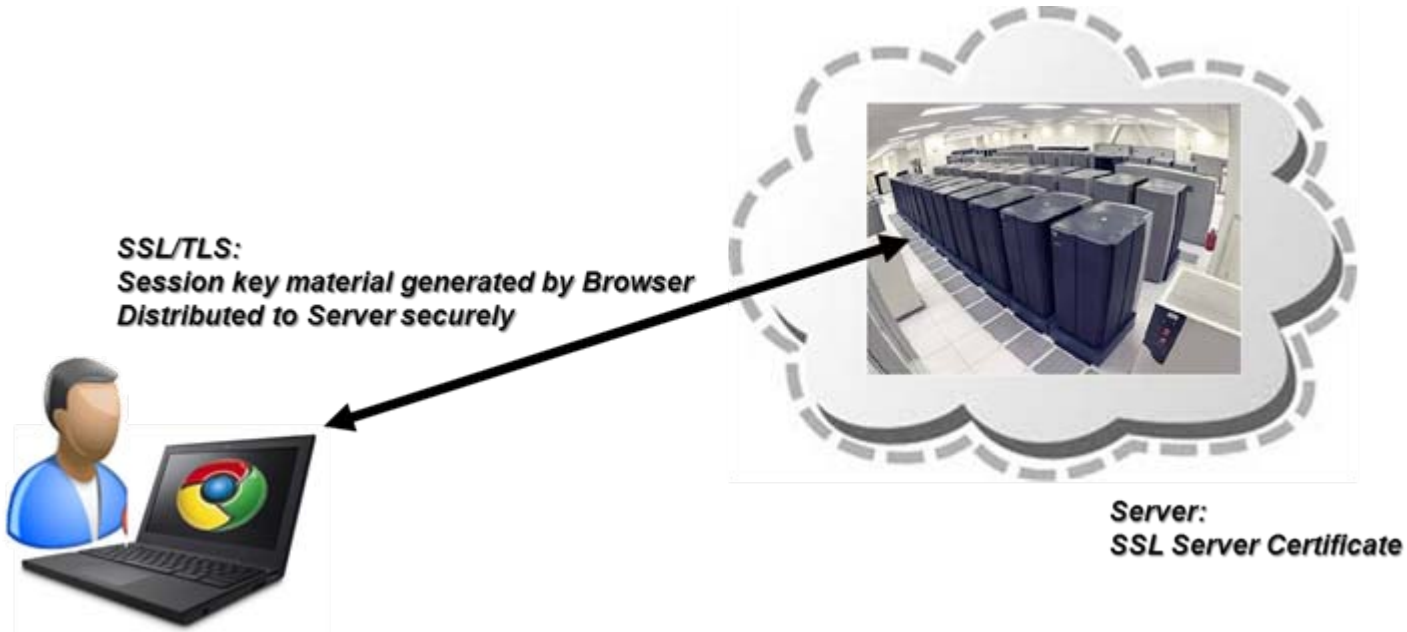
- Cryptographic Keys - Core Functions
  - Confidentiality Protection
  - Integrity Protection
  - Source Authentication
- Key Management - Scope
  - Key Generation
  - Key Storage
  - Key Distribution
  - Key Recovery
  - Key Destruction

Use Case 1: Remote Authentication to Cloud



- Key Management from Cloud User's Perspective
  - Some Visibility
    - Assurance of standard protocols and TTP issued credentials
  - Some Control
    - User may select own Credential Provider, Configure Browser settings

Use Case 2: Secure Communication with Cloud



- Key Management from Cloud User's Perspective
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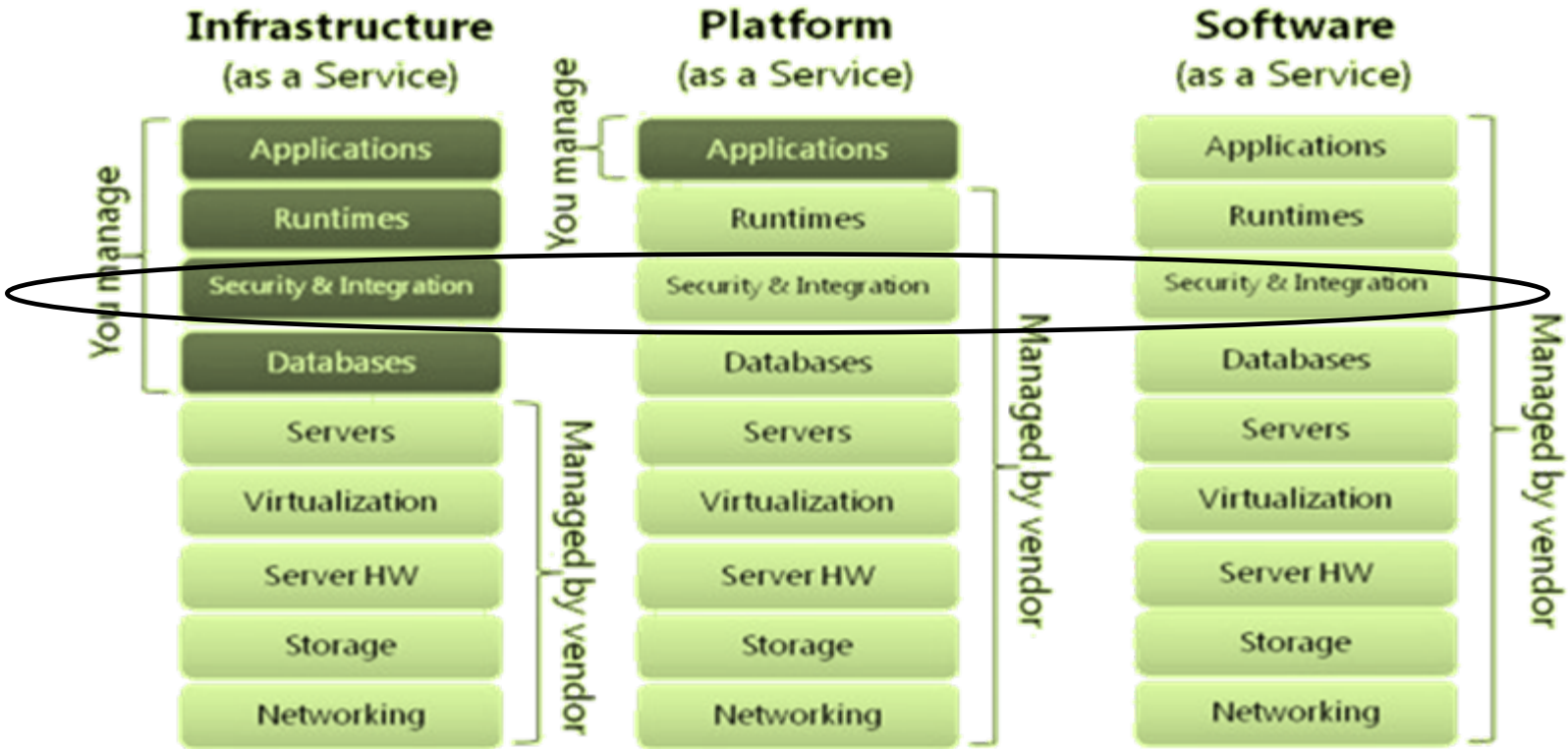
    - Assurance of standard protocols and TTP issued credentials
  - Some Control
    - User may configure browser settings

Use Case 3: Cloud Data Protection



Courtesy of CIO Research Council (CRC)

- Key Management from Cloud User's Perspective
  - SaaS – little or no visibility; little or no control
  - PaaS – limited visibility; limited control
  - Iaas – more visibility; more control

Wrap-Up and Contact Information

- Summary
  - Smart Grid and Cloud are a Natural Fit
  - Cloud Computing presents unique security challenges
  - Cryptography essential to secure cloud operations
  - Sound Key Management Practices critical

- Contact Information
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